THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An apparatus for optical inertial measurement, comprising:

a body;

an optical head mounted on the body, the optical head having at least one optical element creating an optical path to at least one viewing region;

a sensor in communication with the at least one optical element and adapted to receive both linear and two dimensional images of the at least one viewing region; and

a processor adapted to receive signals from the sensor and perform optical flow motion extraction of the at least one viewing region, the speed and direction of movement of the body and the orientation of the body in terms of pitch, roll and yaw being determined by monitoring the rate and direction of movement of pixel shift within the at least one viewing region, sequentially comparing consecutive images and calculating attitude.

2. The apparatus as defined in Claim 1, wherein there is more than one optical element, each of the more than one optical element being focused in a different direction and angled at a known angle relative to the body.

3. The apparatus as defined in Claim 2, wherein the more than one optical element are spatially arranged around the body to create a symmetric layout of optical paths.

4. The apparatus as defined in Claim 2, wherein there are at least five optical elements optical elements focused in a different direction and angled at a known angle relative to the body to create an optical viewing path to at least five viewing regions.

5. The apparatus as defined in Claim 2, wherein at least

one of the more than one optical element is a nadir optical element focused to create an optical path to a nadir viewing region.

6. The apparatus as defined in Claim 1, wherein a secondary optical element is provided to create a secondary optical path at a slight angle relative to the viewing region, thereby facilitating stereo-metric calculations to extract a distance measurement.

7. The apparatus as defined in Claim 1, wherein the at least one viewing region is an earth reference viewing region.

8. The apparatus as defined in Claim 1, wherein the at least one viewing region is a celestial reference viewing region.

9. An apparatus for optical inertial measurement, comprising:

an elongate body having an axis, the body being adapted for mounting with the axis in a substantially vertical orientation;

an optical head mounted on the body, the optical head having at least five earth reference optical elements arranged spatially around the axis in a known spatial relationship, with each of the earth reference five optical elements being focused in a different direction and angled downwardly at a known angle relative to the axis to create an optical viewing path to an earth reference viewing region, one of the five earth reference optical elements being a nadir optical element focused along the axis to create an optical path to an earth reference viewing region of a nadir;

a sensor in communication with each earth reference optical element, the sensor being adapted to receive both linear and two dimensional images of each earth reference viewing region; and

a processor adapted to receive signals from the sensor and perform optical flow motion extraction of each earth reference viewing region individually and collectively, the speed and direction of movement of the body and the orientation of the body in terms of pitch, roll and yaw being determined by monitoring the rate and direction of movement of pixel shift of each of the earth reference viewing regions, sequentially comparing consecutive images and calculating attitude.

10. The apparatus as defined in Claim 8, wherein secondary optical elements are provided to create a secondary optical path at a slight angle relative to the earth reference viewing region, thereby facilitating stereo-metric calculations to extract a distance measurement.

11. The apparatus as defined in Claim 9, wherein a secondary optical head is provided to provide an optical

path focused upon arbitrary regions of the sky as at least one celestial reference viewing region, the processor determining position by monitoring the rate and direction of movement of pixel shift of the at least one celestial reference viewing region, sequentially comparing consecutive images and calculating attitude.

12. A method for optical inertial measurement, comprising:

receiving images of at least one viewing region;

performing optical flow motion extraction of the at least one viewing region, with the speed and direction of movement and orientation in terms of pitch, roll and yaw being determined by monitoring the rate and direction of movement of pixel shift within the at least one viewing region, sequentially comparing consecutive images and calculating attitude.

13. The method as defined in Claim 12, there being more than one viewing region to statistically enhance the accuracy of and the flow motion extraction.

14. The method as defined in Claim 12, the viewing region being an earth reference.

15. The method as defined in Claim 12, the viewing region being a celestial reference.